RETRO DIGITAL

Let's forget analogue for a minute and delve into some of the pioneering gear and musical approaches taken as the digital revolution swept the planet

VIDEO ON FILESILO

The 1980s were a truly remarkable decade for music technology. Digital sampling, new approaches to sound synthesis, the industry-wide adoption of MIDI as a control protocol, the workstation concept, multi-timbrality… the list of groundbreaking developments is impressive. But there are horror stories from the period, too, with clumsy interface design and a questionable drive towards 'realistic' sounds high on the lists of the era's biggest mistakes.

This month, we're going back in time to the pioneering sounds of the DX7, the D-50 and the M1. We're also allowing ourselves to cross the divide into the 1990s, to look at some of the sampling techniques popular with pioneering drum & bass producers. We'll look at how hardware effects units didn't feature the shimmering high sample rates and resolutions of those we use today, and how these limitations produced some classic (and easy to emulate) sounds. But we'll also place some of the key technology in context, to understand how such extraordinary musical developments unfolded in such a short time-frame. So grab the hair gel and rip your jeans at the knees. It's time to go retro digital.

Golden era or embarrassing decade?

Since the days in which the first commercially available synthesizers were released for sale, through to the present day, it's clear that there are many people in the world fascinated

by the concept of making new sounds from oscillators, filters and amplifiers. Look around at the musicians working with synths today, and you'll find that those technologies have diversified considerably. For some, Eurorack and modular systems are the most important and 'pure' form of what electronic music production can be. For others, synthesizer sounds built into rugged keyboards for touring and live performance matter most. And, of course, there are millions of producers around the world whose fascination with what synthesizers can do is exclusively allied to the software they use, with no synthesizer hardware in their studios at all.

If we were writing a potted history of synth design, it would be relatively straightforward to summarise the 1970s as the golden age of analogue synthesis, with increasingly capable technologies offering richer, thicker, more expansive sounds. But classifying the characteristics of synthesisers from the 1980s would be much harder, partly because the instruments available at the beginning of that decade differed in capability so wildly from those ten years later.

A huge part of this is due to most synthesizer manufacturers from that period becoming increasingly motivated by the notion of 'realism'. When Moog, Buchla and the other 1960s synth pioneers brought synthesis into the mainstream, it's hard to imagine that they would have considered making realistic string, piano and brass sounds a high priority, but in the '80s, this became an obsession for Roland, Korg and Yamaha. Digital sampling, the solution that came to the fore as the method for getting 'realistic' sounds, was prohibitively expensive and technologically under-developed to be a 'sole' source of sound generation at that time. Today's enormous orchestral sample libraries, upon which media composers are now reliant, would have been nigh-on impossible to achieve back then.

And yet some sampling technology did exist, and integrating this limited tech with synthesis became a popular approach throughout the 1980s. So, as an example, the idea of gluing a one-shot 'blow' onto a sustained synthesizer tone to make a combined sound which might be stored as a preset called 'flute' seems laughably naïve when compared to the round-robin, multi-sampled sounds underpinning so many of today's productions.

With the benefit of hindsight, it's easy to see this as an unnecessary and foolish mission, as we all know that what happened over the next ten years: year on year, digital sampling became more capable and more cost-effective, and storage went from being measured in megabytes to being measured in terabytes.

And yet you only have to register the number of contemporary artists heavily influenced by the sounds of the 1980s to recognise that instruments from that era have made an indelible impression on music ever since. Through these pages, we're going to experiment with their approaches to see how they can impact upon your own work.

The synth pop pioneers

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As with all musical genres, understanding the seminal pop and dance records of the 1980s requires an understanding of the background to which those records formed the soundtrack. Most of the pioneers of '80s pop cite the arrival of Kraftwerk as the most significant influence on the music they went on to make. Kraftwerk had a look and a sound that set fire to the imaginations of kids who'd felt cut adrift by a rock scene. Acts like OMD (Orchestral Manoeuvres in the Dark), The Human League, Depeche Mode and Gary Numan all took direct influence from the sound of Kraftwerk, but they were also inspired by the political and socio-economic situation of the early '80s. As many of the synth pioneers will point out, despite punk's self-proclaimed anti-establishment ideals, it was much braver to paint your nails, wear makeup and play synthesisers in the late 1970s than it was to cause a riot at a punk gig. A brittle confidence arose, triggering a movement that continues to this day.

But just as importantly, what the synth pioneers did, just as the studio engineers of the previous two decades had done before them, was to push the boundaries of technology, wringing new sounds from gear pushed to its limits. Depeche Mode, for instance, started life as a four-piece band where each player (except Dave Gahan, the singer), played a monosynth live, whilst one member began each new track by setting the tempo on a drum machine to keep everyone in time. Founding member Vince Clarke makes no secret, though, that once sequencers became viable ways to produce backing tracks, the self-confessed control freak in him decided to quit as he no longer needed bandmates. Suddenly, technology could fulfil their roles.

> "It was much braver to paint your nails, wear makeup and play synthesizers"

Similarly, the earliest digital samplers also prompted a host of musicians to think in more grandiose ways. Depeche Mode (with Martin Gore having replaced Vince Clarke as the main songwriter) now used E-mu's Emulator to sample metallic and industrial sounds on 1983's *Construction Time Again*, to rail against an increasingly corporate world, whereas the lusher, more symphonic sound of the Pet Shop Boys' *West End Girls* used exactly the same sampler to program the backing track of a lavish record which mixed pop writing with American dance music. New Order were also inspired by the clubs of New York around the same time – whilst the iconic *Blue Monday* was initially written to form an alternative to the traditional encore at the end of their live shows, it became popular enough to become the best-selling 12" single of all time.

Of course, these are just some of the many examples of pop bands using technology creatively through this period; the intoxicating blend of a new generation of artists inspired by the financial and political landscape of the time and a seemingly endless series of technological developments. These kept new synths, samplers, sequencers and effects units flooding the market every year with ever more sophisticated ways of producing new sounds, maintaining an unstoppable momentum. If the sounds of this era are of interest to you, BBC4's *Synth Britannia* (**bit.ly/SynBrit**) is well worth watching, as it features interviews with many of the artists of this period discussing their work and musical approaches. Their brave decision to adopt technology as their musical obsession is still paying dividends many years later.

Noisy reverb tails

Hardware reverbs of the '80s usually offered lower sample rates than we're used to today, providing crunchier, grittier decay phases

If you could wander back in time and find yourself in a well-appointed studio of the late 1980s or early 1990s, as well as the swathes of synths and the all-important mixing desk, you'd find hardware effects modules of reverbs and delays, ready to be accessed from the desk's auxiliaries. Hardware reverbs such as Lexicon's PCM range were popular, but so were Alesis' more affordable units, including the flagship Quadraverb. These digital reverbs' lower-than-pristine sample rates ensured a slight grittiness, with characteristic aliasing, particularly when decay tails came towards their conclusions or when working at low levels. Some producers became so frustrated by the ends of reverb tails that they turned to gates to kill their volumes off altogether, creating an even more distinctive effect…

We've selected a detuned lead sound from NI's FM8, to provide a DX7 like 'siren synth' to our mix. To this, we add Valhalla's VintageVerb on Auxiliary 1. This provides a slightly pitch-modulated reverb decay, but despite its retro nature, it still sounds quite clean.

After the reverb insert, we add a bitcrusher. We set this to 12-bit resolution, with 2x downsampling. This colours the sound nicely, adding some digital aliasing to the audio picture. This is particularly noticeable when the signal decays to near silence at the end.

We add the rest of our backing track, featuring a similarly FM-style pad sound, an early '80s 'industrial' style percussion sequence and a eighth-note bassline. We send the pad to the same reverb, so that it also picks up some of the digital crunchiness as it decays.

Building a classic '80s pad

Here's how to build that staple of the '80s pop and dance music hit, the synth pad. Any subtractive synth will let you design a similar sound

We're starting with a 'scratch patch' in Logic's ES2 synthesiser, one that bears little resemblance to the warmth and richness of an '80s pad. We have a single sawtooth wave oscillator with a wide-open filter. We do program a chord progression which feels harmonically 'of the era'.

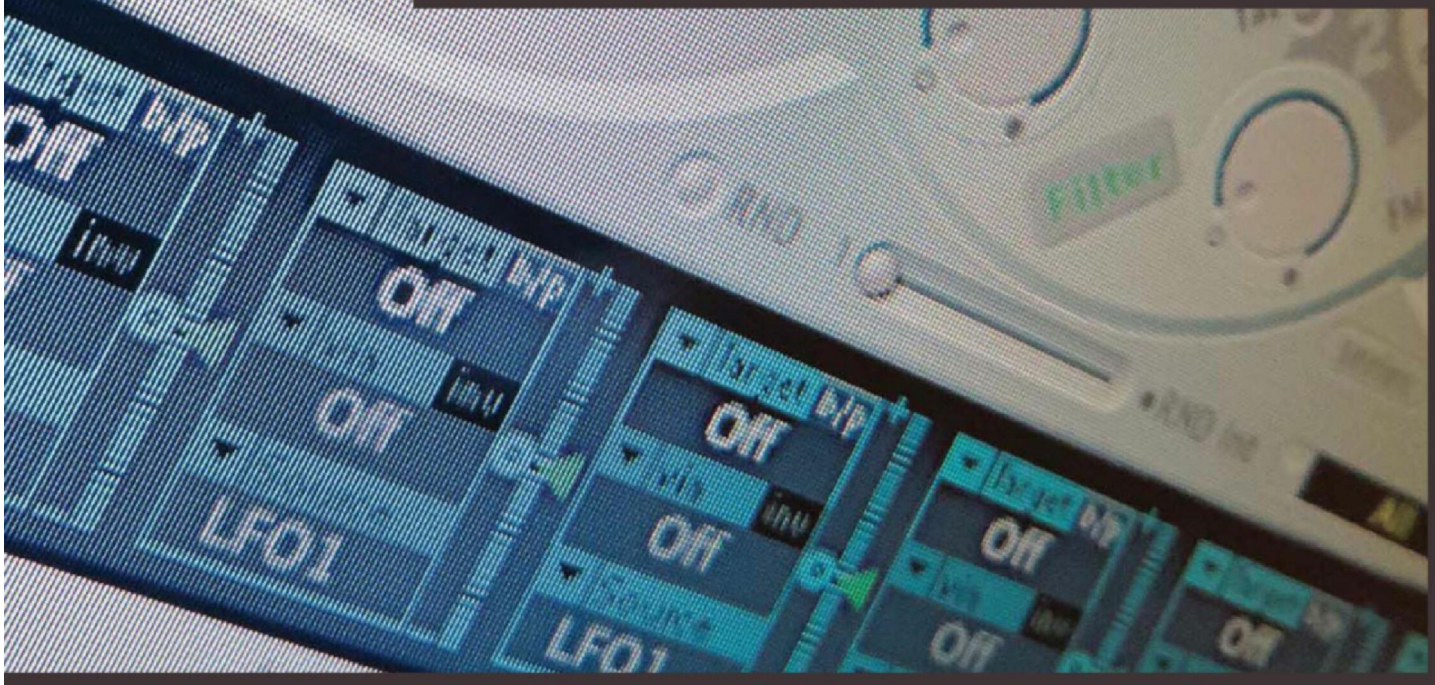
We start by shaping the filter, keeping the 24dB low-pass shape but dropping the cutoff point dramatically, so the tone becomes smoother. We set an envelope to control the filter, with a 280ms attack time, a long decay (2.5 seconds) and a 50% sustain level.

Next, we shape the amp envelope. This gains a longer attack (300ms), full sustain level and a release time of 730ms. This softens the beginnings and ends of each note. We tweak the filter envelope, dropping the envelope-to-filter-cutoff amount a little more.

We introduce a second oscillator. This features the same waveform as Oscillator 1 but we set a balance between the two oscillators using the blend 'triangle'. If your chosen synth features level dials for each oscillator instead, use these. We detune the oscillators +/-12 cents.

We add a third oscillator, this time using a square wave with variable pulse width. We audition a few 'positions' for pulse width before settling on a position which suits the other oscillators. We also detune this oscillator by 6 cents before setting a blend between all three waveforms.

Alongside our pad, we program Kick, Snare, Hat and Clap parts, as well as bringing in a classic '80s synth bass sound and pattern. Effects-wise, we add two reverbs from UAD's AMS RMX16 and Valhalla's VintageVerb, plus some sheen from the Maag EQ4.



Synth design horrors

The '80s, in particular, was a seminal decade for synthesizer design, with digital approaches to synthesis offering a wealth of sonic opportunities that simply weren't feasible during the 'analogue-only' years. But there's no denying that, for all of the positives, there's an elephant lurking in the room and for all the producers and programmers who worked with synths during that period.

Have a look at the photograph of the Korg Wavestation below. Looks pretty slick, doesn't it? All that black matte plastic and the super-large LCD display… a minimal design classic, you might argue. But in truth, it's a triumph of form over function. Yes, the Korg Wavestation was capable of remarkable sounds but, as you should be able to see from its rotary encoder, five 'soft' keys, whose functions corresponded to endlessly changing menus on that display, and a collection of numeric buttons, meant that programming it was so much harder than it needed to be. Paper manuals hundreds of pages long would explain how, in order to adjust a filter envelope, you needed to enter an Edit mode (which would vary in function depending on whether you were working with 'Multi' or 'Single' patches), before clicking a different button to select the filter, another to select its envelope and then several more to access the appropriate parameter to adjust.

For those masochistic enough to try seting up an LFO, it's fair to say that the return to slider and dial-laden synthesizers is a 'survival of the fittest' moment of celebration; synthesizers are simply not designed to be programmed through multiple menus. As such, whilst it was slightly derided at the time of its release, Roland's enormous JD-800 was an important instrument; ushering in an example of the 'second coming' of tactile synthesizer interfaces.

Korg's Wavestation is just one example of a synth whose capabilities required stamina and determination to actually program

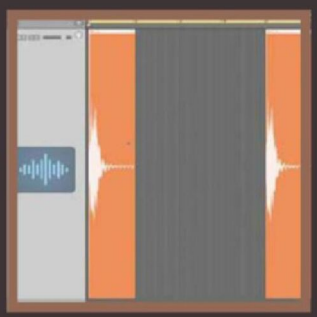
Working with '80s synth techniques

In the 1980s, the battle between synth manufacturers revolved around a number of key technologies. Aside from the quality of the onboard sounds, the number of notes a synth could produce simultaneously was a big deal. You'd see instruments badged as '64-voice polyphonic', which would give you some indication of how many notes an instrument could play at once – if using a sequencer, you could easily demand multiple voices on multiple MIDI channels. Another way multiple voices could be triggered at once was when your synth switched from 'Single' to 'Multi' mode. The Korg M1 is an example of such capability, using key splits to offer a number of patches across the keyboard at once. Whereas the bottom two octaves might trigger a bass sound, the upper section might offer a lead synth, offering a richer, lusher contribution than a single sound when playing live. Equally, you might have a range of sounds trigger across the keyboard with a pad sound giving way to a couple of slowly evolving soundscapes. Modern performers might be at peace triggering clips from Ableton Live on-stage, or having a number of pre-recorded tracks playing beneath the single part they're playing on top, but experimenting with keysplits and layers, to be played simultaneously, gives a different kind of workflow which can really open the creative floodgates.

Roland's sample and synthesis sounds

Roland D-series synths combined ROM-based samples with a digital synth engine to offer new realms of sonic possibility

In the late 1980s, as 'realism' became an increasingly important part of what synth manufacturers were trying to achieve, companies adopted different approaches to produce the most lifelike sounds. Roland's recognised that the most difficult-to-synthesize element of a sound was its attack portion, so through its D-series synthesizers (with the flagship D-50 at the top of the tree), it offered a hybrid approach, offering a series of short attack samples stored in ROM, to which you could add a 'synthesized' decay, sustain and release waveform. This approach became so popular that it remained Roland's predominant technology all the way through the JV and XV synth module ranges of the 1990s. Here's how you can work with a similar 'Sample And Synthesis' approach in your DAW.



We plug a microphone in and record a number of one-shot sounds, eventually selecting a short 'ha' breath sound. On the D-series synths, one-shot samples like this were stored in ROM, ready to be combined with digitally generated 'synth' layers for composite sounds.

We program a backing track consisting of programmed bass and pad sounds, with an Apple Loop providing the beats. On top, we seek out an appropriately '80s top line in Alchemy. At the moment, the two layers are a Vocal and a Flute. Oscillators 3 and 4 aren't being used.

We add our sampled 'ha' sound as the third sound layer in the Alchemy patch. We automate the volume of this so that the first time round, the mix is as it was originally. Second time around, we hear more articulation in the lead sound as the 'ha' provides extra attack.

QUICK TIPS

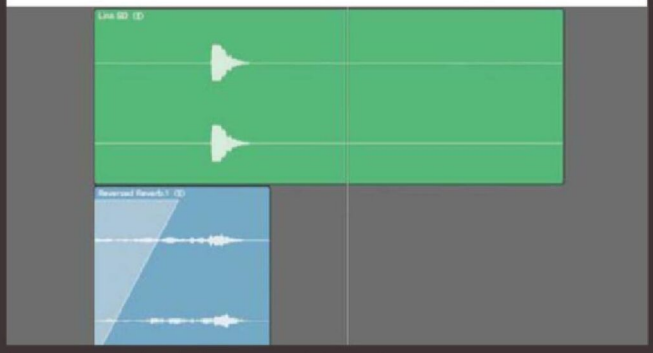
These days, our computers can play hundreds of tracks at once. But '80s sequencers and synths couldn't. Their 'limitations' are often their strengths – keep things simple.

One of the most endearing things about limited sampling technology are dodgy loop points and single samples being stretched over more keys than is entirely 'musical'. Let a few samples go a long way.

Research specific pieces of gear. It's not hard to find out which synths were used on classic '80s albums before digging into their feature sets to discover how they actually worked.

Don't be afraid to work at lower sample rates, or to use bitcrushers on every channel. This doesn't have to mean super-low 8-bit sample rates – work at 16-bit or 12-bit, and things will immediately sound more 'of that era'.

Creating Reversed Reverbs



Here's a reversed reverb leading into a snare sound. A staple '80s treatment.

One of the most popular features of sampling has always been the capacity to reverse sounds which, in computing terms, is simple enough [a computer just has to reverse the order of the samples representing the audio] that 'Reverse' is an edit feature common to almost all samplers. Reversing reverb also became a hugely popular technique during the late 1980s and early 1990s. To achieve this effect, you firstly need to reverse your source sound, before de-coupling it from the reverb it triggers. This is easy to do if your DAW allows you to solo your auxiliary returns. Once the auxiliary is soloed, bounce the reverb, which, of course, will sound 'backwards' due to the reversed nature of the source sound. Then, bring the reverb back into your DAW and reverse both the source sound and the reverb so that they're the right way around. The reverb will now grow in volume 'into' the original, dry sound.

Experiment with tape emulation plugins

The '80s and '90s offered synthesizers whose sound have, like those of their 1960s and 1970s forebears, gone down in pop and dance music history as classics. But it's worth remembering that the sounds these instruments could produce – alone – were not the only participating factor in the way many records from that era sound. The hard disk recording revolution we take for granted arrived, for most studios, late enough to ensure that most records from the '80s were recorded to tape. If you're inspired by sounds from those eras, experiment with tape emulation plugins to properly situate your productions.

Further refining bitcrushed reverbs

Earlier, we looked at how digital reverbs from the '80s were prone to characteristic aliasing during their decay stages, and we replicated this by inserting a bitcrusher after the reverb on an auxiliary bus. Some reverbs displayed this sonic quirk just as the reverb decay faded to near silence, so if you're looking to finesse the effect, you could experiment with setting your bitcrusher up on a second auxiliary channel and sending the reverb 'on' to this channel from its own auxiliary. If you then automate the level of the bitcrusher auxiliary's return, you can introduce this only when you want it, making the effect

Work with channel strip plugins

Many '80s records were recorded to tape, so in order to make records with hardware synths, mixing desks were a requirement for every studio. While MIDI connections ensured that data zipped from sequencers to synths and sound modules, those synths then converted these signals into audio which was connected by 1/4" jack plugs to a mixing desk. Here, they could be balanced, EQed, panned and so on. Experiment either with finding a way to pass your plugins out of your computer and back in again, or by using gain and channel strip plugins that allow you to emulate a mixer's behaviour.

Deliberately limit your FX provision

Today's DAWs offer as many effects as we could wish for, but things weren't always so simple. Onboard effects, such as reverb, only became standard on synths of the late 1980s onwards, and the idea of adding different effect types to every part of a multitimbral performance was a pipe dream. The old adage, 'Using a single reverb helps glue a mix together' stems from this time – if the reverb you choose is appropriate for a number of instruments, they can feel more 'connected'. If you're drawn to a 1980s approach to programming, it can pay to keep effects choices deliberately minimal.

The 1980s: a technological timeline

To understand the music of the 1980s, you need to comprehend the rapid technological developments that underpinned it, which changed the course of music history and opened up new avenues of sonic possibility to musicians working in pop, dance, jazz and film composition. Let's take synthesizers as an example – coming out of the late 1970s, subtractive synths were king, but as the 1980s took hold, a number of new sonic developments took place. This was perhaps best demonstrated by Yamaha's DX7, which was released in 1983. This used Yamaha's seemingly (at least initially) baffling 'Frequency Modulation' synthesis ('FM', for short) to produce bright, shiny sounds, the likes of which 'regular' subtractive synths struggled to create. The electric pianos, bells and tines of the DX7 were everywhere during the 1980s, but this was also an instrument to turn to for warm string pads and rooted, hard basses.

The DX7 forced a response from a range of other companies, and Roland's Jupiter-8 was the main rival, but it wasn't until their D-series instruments that Roland finally caught up with the DX7's success. The D-50's Linear Arithmetic (LA) synthesis approach provided its own blockbuster smash hit from 1987 onwards. So popular was the D-50 that it had out-sold the DX7 by the end of the decade. Eric Persing, now of Spectrasonics, was among the chief sound designers for the D-50, and his sounds became classics in their own right, being ported from one Roland synth to the next throughout the 1990s.

Not to be outdone, Korg provided the world with its first superstar workstation, the M1, in 1998. The workstation concept already existed, whereby synths offered onboard sequencing and multi-timbrality, so that several parts could play back at once, allowing a whole track to be produced within a single instrument. But with its combination of ear-catching new sounds, onboard effects and more sophisticated sequencing, the M1 swept all before it, becoming the best-selling synth of its time between 1988 and 1995.

> "Akai's MPC series overlapped with their iconic S-range of samplers"

If important developments were taking place in the field of synthesis, they were nothing compared to the giant strides that sampling took over the same period. At the dawn of the decade, the Synclavier set the benchmark for what 'sampling' could be. The only problem was that almost nobody could afford one, due to the six-figure retail price. While multi-million-selling artists could bring the Synclavier's tones to their records, most had to bide their time. The Fairlight CMI took a step in the right direction, but at $25,000, it too was beyond the reach of most. As the cost of computing components fell through the floor in the early 1980s, so sampling suddenly became viable for many more producers, with E-mu's Emulator II and Ensoniq's Mirage both examples of mid-'80s instruments which helped to take sampling into the mainstream.

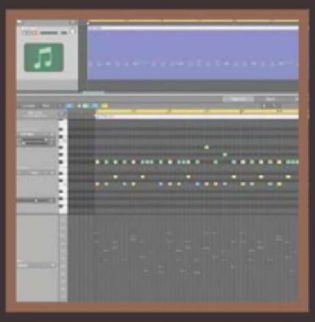
Akai's MPC series of instruments, which arrived in 1988 and which overlapped with their iconic S-range of samplers, picked up where these instruments left off, and with Roger Linn having been brought in as a design consultant, it's no surprise that Akai's units became particularly popular with beat makers and the hip-hop community in particular.

By the mid 1980s, the MIDI protocol was standard across all synths, and sequencers, were also developing fast. Notable examples include Casio's CZ-5000 (1985), Yamaha's QX5 (1986) and Roland's MC-500 (1986). Dedicated hardware for sequencing was increasingly fighting a software equivalent by now too, with C-Lab's Creator for the Atari ST becoming an industry standard from 1987 onwards. Whichever technology you dig into, the musical landscape at the end of the 1980s into the early 1990s bears so little resemblance to a decade earlier, it's no wonder this technology is still making its influence felt.

Early drum & bass breaks

Let's create a drum & bass break by first preparing our own, programmed source material at half-speed

Whilst modern software samplers are awash with staggering capabilities, the limited recording time and less fully specified featuresets of their hardware forebears are nevertheless responsible for providing some classic late '80s and early '90s sounds. Early D&B producers relied on technology like Akai's S1000 and MPCs, and Roland's S760 to sample and chop up breaks and produce patterns radically divorced from the speed of their chosen source material. The *Amen* break is, without question, the most famous example of this approach, but if you're drawn to the simplicity of this kind of sampling, why not create your own 'breakbeat' from adopting the sampling approach of the early drum & bass pioneers? All you need is a little programming, some decent drums, and some basic maths.



> We're starting with a four-bar drum part programmed from FXpansion's BFD 2. We're working at 82bpm, and we've programmed a pattern which features some syncopation. In particular, rather than placing snares on beats 2 and 4, we've got snares halfway through beats 3 and 4 in some bars.

> We render this as an audio file and drag and drop it into a sampler. We want to ensure that the sample can play back across a number of keys, so we place the original sample on C3 and ensure that the key range extends to an octave higher – C4.

> Triggering the loop an octave higher plays it back at twice the speed, providing that immediate drum & bass feel of the early 1990s. We can hold the sample down to create a two-bar loop at 164bpm (2 x speed = 1/2 original length) or trigger it in repeatedly to build new rhythms.

Creating Wavestation-era sequences

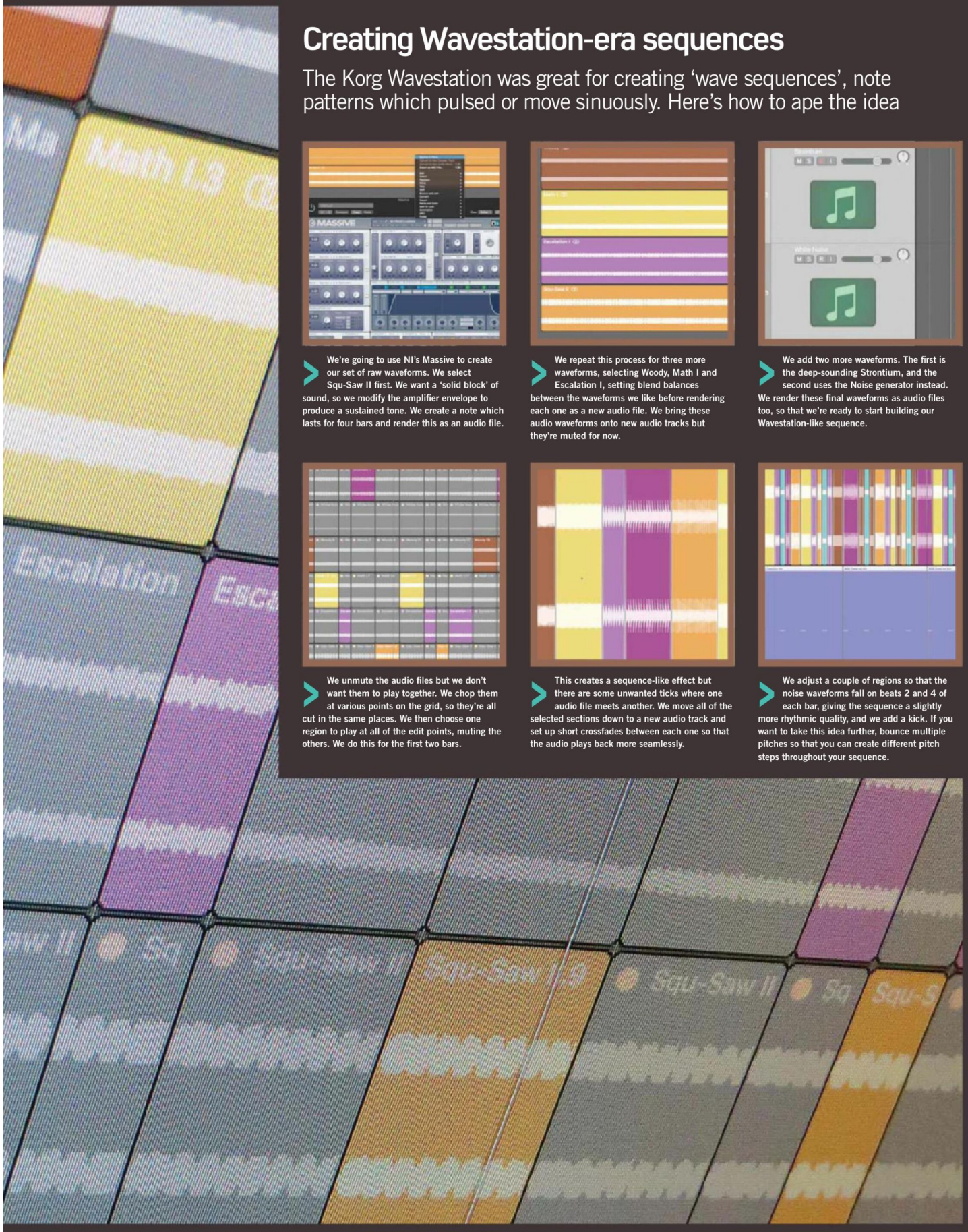
The Korg Wavestation was great for creating 'wave sequences', note patterns which pulsed or move sinuously. Here's how to ape the idea

We're going to use NI's Massive to create our set of raw waveforms. We select Squ-Saw II first. We want a 'solid block' of sound, so we modify the amplifier envelope to produce a sustained tone. We create a note which lasts for four bars and render this as an audio file.

We repeat this process for three more waveforms, selecting Woody, Math I and Escalation I, setting blend balances between the waveforms we like before rendering each one as a new audio file. We bring these audio waveforms onto new audio tracks but they're muted for now.

We add two more waveforms. The first is the deep-sounding Strontium, and the second uses the Noise generator instead. We render these final waveforms as audio files too, so that we're ready to start building our Wavestation-like sequence.

We unmute the audio files but we don't want them to play together. We chop them at various points on the grid, so they're all cut in the same places. We then choose one region to play at all of the edit points, muting the others. We do this for the first two bars.

This creates a sequence-like effect but there are some unwanted ticks where one audio file meets another. We move all of the selected sections down to a new audio track and set up short crossfades between each one so that the audio plays back more seamlessly.

We adjust a couple of regions so that the noise waveforms fall on beats 2 and 4 of each bar, giving the sequence a slightly more rhythmic quality, and we add a kick. If you want to take this idea further, bounce multiple pitches so that you can create different pitch steps throughout your sequence.